

The cited text takes as its foundation the static model of competitive equilibrium. As discussed above in Section II, a competitive market is a living, dynamic process always in motion toward an ever-moving target, the competitive equilibrium. A dynamic competitive market does not guarantee equal earnings, rates of return, or productivity growth rates.

The important point is that "the fact that the heterogeneity in *earnings* exists" (emphasis added) provides no more justification for a multiple X-factor paradigm than it does for a single industry-wide 'X' model. The only proper basis for a multiple 'X' framework is that given at the beginning of this section:

The prima facie case for multiple 'X's requires that (a) economic conditions beyond the LECs' control vary across markets, (b) they vary in ways that are expected to naturally and inevitably influence the firms' productivity performance, and (c) the effects of these differences in economic conditions on industry-average 'X' can be quantified in ways consistent with economic principles.

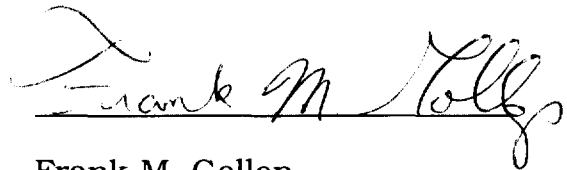
V. CONCLUSION

An industry-average X-factor based on moving averages is clearly superior to any model of LEC-specific X-factors. A single-industry 'X' is consistent with economic principles and does not distort LEC incentives to maximize productivity growth. LEC-specific paradigms are condemned by the fact that superior performance is penalized with rising X-factors and inferior performance is rewarded with reduced X-factors. Moreover, in contrast to the hallmark characteristic of price-taking behavior in a competitive marketplace, LEC-specific X-factors give firms market power, their behavior today can affect their prices tomorrow.

A single-industry 'X' also dominates a paradigm establishing a finite number of X-factors for subsets of "homogeneous" LECs. As a matter of economic principles, differences in LEC earnings do not establish the prima facie case for establishing multiple X-factors. They in no way rebut the case for a single 'X'. Short of a careful investigation of the "precise causes of variation among companies" and quantification of the importance and magnitude of these differences, the single 'X' model remains the preferred policy tool.

The relative advantages of a single 'X' model are considerable. Combined with a moving-average process, it satisfies all three FCC

criteria for an appropriate X-factor paradigm. It is soundly based in economic principles. It guarantees that ratepayers will share in ongoing productivity gains. It is simple to implement and is based on data easily subject to public scrutiny. At best, any multiple X-factor model fails to satisfy, at least, the first and third criteria. At worst, a multiple 'X' model may induce firms to engage in strategic behavior in order to change their subset classification and/or the magnitude of their 'X' adjustment. Since productivity growth is unambiguously welfare improving, the X-factor model must be designed to maximize the LECs' incentives to improve productivity. Whether evaluated on this ground alone or on the full set of criteria enunciated by the FCC, the single X-factor paradigm clearly dominates any LEC-specific or multiple 'X' model.

A handwritten signature in cursive script, reading "Frank M. Gollop", written in dark ink.

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RECENT REFEREEING ACTIVITY:

American Economic Review, National Science Foundation, Review of Economics and Statistics, Land Economics, Southern Economic Journal, Quarterly Journal of Economics, The Canadian Journal of Economics, The Economic Journal, Journal of Industrial Organization, Journal of Agricultural Economics.

PUBLICATIONS:

"Structural Inflation in the United States, 1964-1966," The American Economist, 13, No. 2 (Fall 1969), pp. 31-39.

"The Impact of the Fuel Adjustment Mechanism on Economic The Review of Economics and Statistics, 60, No. 4 (November 1978), pp. 574-84 (with Stephen Karlson).

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"The Effect of Warranty on Used Car Prices," in Pauline Ippolito and David Sheffman (eds.), Empirical Approaches to Consumer Protection Economics, Washington, D.C.: Federal Trade Commission, 1986 (with Jim Anderson).

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Comments on "Regulatory Failure, Regulatory Reform, and Structural Change in the Electric Power Industry" by P. Joskow in M. Bailey and C. Winston (eds.), Brookings Papers on Economic Activity, Washington, D.C.: Brookings, 1989.

"A Generalized Index of Diversification: Trends in U.S. Manufacturing," The Review of Economics and Statistics, 73 (May 1991), pp. 318-30 (with James Monahan).

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"Productivity Growth in U.S. Agriculture: A Postwar Perspective," American Journal of Agricultural Economics, 74 (August 1992), pp. 745-750 (with Dale Jorgenson).

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"The Heterogeneity Index: A Quantitative Tool to Support Industrial Classification," Bureau of Economic Analysis Report (BE-42), Economic Classification Policy Committee. Washington, D.C.: U.S. Department of Commerce, May 1994.

"Do Industrial Classifications Need Re-Inventing? An Analysis of the Relevance of the U.S. SIC System for Productivity Research," Proceedings of American Society of Information Systems/Classification Research Workshop. Chicago: American Statistical Society, October 1995, forthcoming (with Jack Triplett, D. Mark Kennet, and Ron Jarmin).

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"Entrepreneurial Income: A Noncompetitive Return to Labor and Capital," Bureau of Labor Statistics Working Paper (June 1977), 20 pp.

"A Behavioral Model of Production: Oligopolistic Markets," Social Systems Research Institute Workshop Paper 7811 (April 1978), 27 pp. (with Mark Roberts).

"An Intertemporal Model of Behavior: The Regulated Monopolist," Social Systems Research Institute Workshop Paper 7812 (May 1978), 24 pp. (with Stephen Karlson).

"Imperfect Factor Market: The Case of Unionization," Social Systems Research Institute Workshop Paper 7813 (June 1978), 31 pp.

"A Note on Applications of Production Theory," Social Systems Research Institute Workshop Paper 7901 (January 1979), 10 pp.

"Demand Elasticities and Transformation Possibilities in the Electric Power Industry: A Multiple-Output Model of Production," Social Systems Research Institute Workshop Paper 7931 (November 1979), 22 pp. (with Stephen Karlson).

"Returns to Scale in Multiproduct Firms: An Application to the Electric Power Industry," Social Systems Research Institute Workshop Paper 8001 (January 1980), 18 pp. (with Stephen Karlson).

"Productivity and Growth of Sectoral Output in the United States, 1948-1979," (February 1986), 42 pp. (with D. Jorgenson and B. Fraumeni).

"Productivity Measurement and Earnings Analysis: Dollars and Sense," (March 1989), 19 pp.

*"Does the SIC System Need Re-Inventing for Productivity Research?" (November 1994), 24 pp. (with Jack Triplett, D. Mark Kennet, and Ron Jarmin).

*"The Pin Factory Revisited: Diversification and Productivity Growth," (November 1994), 27 pp.

*"The Battle Against Major Air Pollutants: Some Wartime Statistics," (February 1995), 36 pp. (with Kelly Chaston and Kathleen Lang).

PAPERS PRESENTED AT PROFESSIONAL MEETINGS:

- 1975 Conference on New Developments in Productivity Measurement, National Bureau of Economic Research: "United States Factor Productivity by Industry, 1947-1973."
- 1976 Econometric Society: "The Impact of the Fuel Adjustment Mechanism on Economic Efficiency."
- 1979 Conference on Productivity Measurement in Regulated Industries, National Science Foundation-University of Wisconsin: "The Sources of Growth in the U.S. Electric Power Industry."

- 1980 Law and Society Association: "A Microeconomic Model of Household Choice: The Household as a Disputant."
- 1981 Conference on Current Issues in Productivity, Rutgers University: "Growth Accounting in an Open Economy."
- 1981 Western Economic Association: "An Open Economy Model of Productivity Growth."
- 1981 Econometric Society: "Environmental Regulations and Productivity Growth: The Case of Fossil-Fueled Electric Power Generation."
- 1981 Conference on Income and Wealth: "Sectoral Measures of Labor Cost for the United States, 1948-1978."
- 1982 Southern Economic Association: "Modeling Aggregate Productivity Growth: The Importance of Intersectoral Transfer Prices and International Trade."
- 1983 Southern Economic Association: "Cost-Minimizing Regulation of Sulfur Emissions: Regional Gains in Electric Power."
- 1984 Federal Trade Commission Conference: "The Effect of Warranty on Used Car Prices."
- 1984 U.S. Bureau of the Census Conference: "From Homogeneity to Heterogeneity: An Index of Diversification."
- 1984 American Enterprise Institute: "Productivity and Growth of Sectoral Output in the United States, 1948-1979."
- 1986 U.S. Bureau of the Census Conference: "Evaluating SIC Boundaries and Industry Change over Time: An Index of Establishment Heterogeneity."
- 1987 American Economic Association Conference: "Measuring Product Heterogeneity."
- 1988 U.S. Department of Agriculture: "Directions for Future Research in the Productivity of U.S. Agriculture."
- 1991 International Conference on the Classification of Economic Activity: "Alternative Approaches to Classifying Economic Activity."
- 1991 American Economic Association Conference: "Productivity Growth in U.S. Agriculture: A Postwar Perspective."
- 1993 John F. Kennedy School of Public Policy Conference: "The Cost of Capital and the Measurement of Productivity."
- 1994 National Bureau of Economic Research: "Does the SIC System Need Re-Inventing for Productivity Research?" (July 1994), 22 pp. (with Jack Triplett, D. Mark Kennet, and Ron Jarmin).
- 1995 Industrial Organization Society Meetings: "The Pin Factory Revisited: Diversification and Productivity Growth" (January 1995).

- 1995 USDA Symposium--Current Topics in Research Evaluation: "State Productivity Statistics: New USDA Estimates of State Multifactor Productivity Growth" (February 1995).
- 1995 Eastern Economics Association: "The Pin Factory Revisited: Diversification and Productivity Growth" (March 1995).
- 1995 Eastern Economics Association: "The Battle Against Major Air Pollutants: Some Wartime Statistics" (March 1995).
- 1995 American Society of Information Systems/Classification Research Workshop: "Do Industrial Classifications Need Re-Inventing? An Analysis of the Relevance of the U.S. SIC System for Productivity Research" (October 1995).

INVITED PRESENTATIONS:

- 1976 Council of Economic Advisors: "Labor Input and the Decomposition of Labor Quality."
- 1976 National Association of Regulatory Utility Commissions, Staff Subcommittee on Economics: "Efficiency Implications of Fuel Adjustment Mechanisms."
- 1977 State of Wisconsin, Public Service Commission: "Critique of 'Preliminary Generic Environmental Impact Statement on Electric Utility Tariffs'."
- 1977 U.S. Bureau of Labor Statistics: "The Measurement of Labor Input."
- 1978 National Academy of Sciences, National Research Council: "Microeconomic Theory Applied to Productivity Analysis: The Link Between Sectoral and Aggregate Accounts."
- 1978 Econometric Society: Comments on "The Econometrics of Exhaustible Resources," by Lars P. Hansen
- 1978 University of Virginia, Department of Economics: "Modeling Factor Market Imperfections."
- 1979 Boston College, Department of Economics: "Firm Interdependence in Oligopolistic Markets."
- 1979 State University of New York at Binghamton, Department of Economics: "The Sources of Growth in the U.S. Electric Power Industry."
- 1979 Federal Trade Commission: "Firm Interdependence in Oligopolistic Markets."
- 1980 American Productivity Center Conference: "Scale Effects and Technical Change as Sources of Productivity Growth."
- 1981 Bureau of Labor Statistics: "The Importance of International Trade in Productivity Accounting."
- 1981 Western Economic Association: Comments on "An Industrial Strategy for the 80s" by Kenneth McLennan.

- 1981 U.S. State Department: "Structural Change, Investment, and Productivity."
- 1982 Boston Bar Association: "Productivity Growth in the United States--The Role of Antitrust and Deregulation."
- 1982 U.S. Bureau of the Census: "Development and Use of the Longitudinal Establishment Data File: Some Recommendations."
- 1982 Committee for Economic Development: "Evidence for a Sector-Biased or Sector-Neutral Industrial Policy: Analysis of the Productivity Slowdown."
- 1983 U.S. Department of Justice: "Cost-Minimizing Regulation of Sulfur Emissions: Regional Gains in Electric Power."
- 1984 Penn State University, Department of Economics: "Evidence for a Sector-Biased or Sector-Neutral Industrial Policy: Analysis of the Productivity Slowdown."
- 1984 U.S. Department of Justice: "From Homogeneity to Heterogeneity: An Index of Diversification."
- 1984 U.S. Environmental Protection Agency: "Cost-Minimizing Regulation of Sulfur Emissions: Regional Gains in Electric Power."
- 1985 U.S. Federal Trade Commission: "Cost-Minimizing Regulation of Sulfur Emissions: Regional Gains in Electric Power."
- 1985 NBER Conference: Comments on "Productivity of Japanese and U.S. Workers in Firms of Varying Size" by N. Hashimoto and J. Raisian.
- 1985 Rutgers University: "The Role of Micro Theory in Models of Productivity Growth."
- 1986 U.S. Federal Trade Commission: "From Homogeneity to Heterogeneity: An Index of Diversification."
- 1986 American Productivity Management Association: "Corporate Earnings and Productivity."
- 1988 U.S. Central Intelligence Agency: "Measuring Productivity Flows Across Sectors in an Economy."
- 1988 Brookings Institution: Comments on "Regulatory Failure, Regulatory Reform and Structural Change in the Electric Power Industry" by Paul Joskow.
- 1989 University of Massachusetts, Amherst: "From Homogeneity to Heterogeneity: An Index of Diversification."
- 1989 Econometric Society: Comments on "Cost Structure in Natural Gas Pipeline Industry" by Robin Sickles.
- 1990 National Academy of Sciences and Academy of Sciences of the USSR: "The Link Between Aggregate and Sectoral Productivity Growth Under Imperfect Competition."

- 1991 Foreign Service Institute, U.S. State Department: "Productivity Measurement and Trends."
- 1995 Industrial Organization Society: Comments on "Evidence from English Auctions: Does Buyer Size Matter?" by Jon Nelson.
- 1995 Eastern Economics Association: Comments on "Why Did Japanese-Style Manufacturing Emerge in Japan and the U.S.?" by Timothy Bushnell.

TESTIMONY BEFORE CONGRESSIONAL COMMITTEES AND FEDERAL AND STATE AGENCIES:

- 1981 U.S. House of Representatives, Committee on Energy and Commerce, Subcommittee on Oversight and Investigations: "The Productivity Slowdown in the United States."
- 1981 Public Utilities Commission, State of Rhode Island. Docket No. 1560. Rebuttal Testimony on Behalf of New England Telephone regarding Productivity Offsets in Telecommunications Rate Setting.
- 1982 U.S. Senate, Committee on Labor and Human Resources, Subcommittee on Employment and Productivity: "Total Factor Productivity--Measurement and Analysis."
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- 1994 U.S. Department of Energy, Office of Energy Efficiency and Reliable Energy: "Economic Analysis of Proposed Rulemaking for Television Receivers."